

SAVR vs. TAVR: Prosthesis–Patient Mismatch as a Predictor of Mortality in a Veteran Population

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Introduction

Prosthesis-patient mismatch (PPM), particularly when moderate or severe, has been associated with increased long-term mortality after surgical aortic valve replacement (SAVR). However, this relationship remains controversial in the context of transcatheter aortic valve replacement (TAVR). Despite ongoing debate over its clinical impact, avoiding moderate and severe PPM is considered best practice among cardiac surgeons.

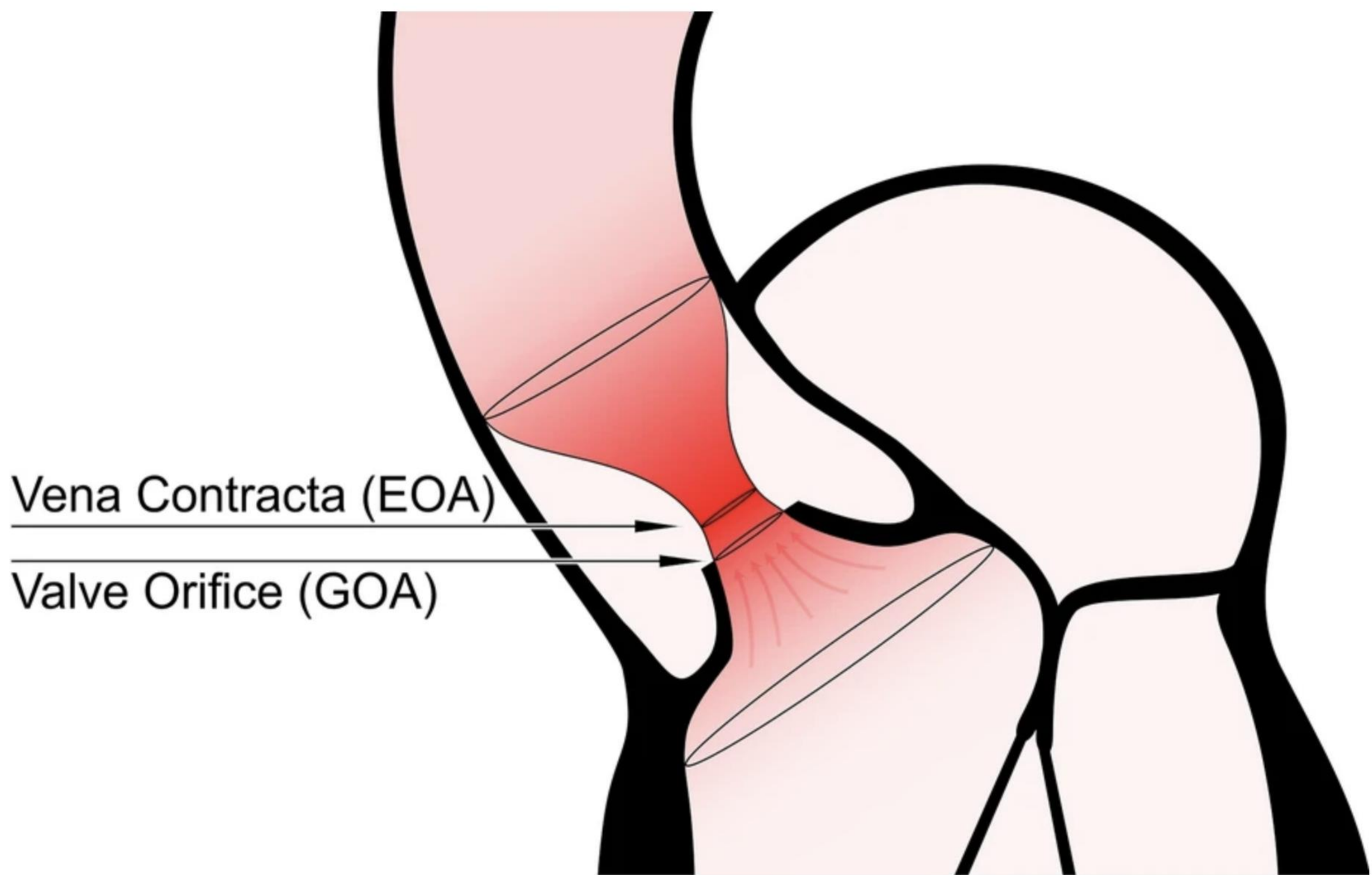
Background

PPM arises when the effective orifice area (EOA) of an implanted valve is too small relative to the patient’s body surface area, resulting in higher transvalvular gradients and impaired hemodynamics. Both SAVR and TAVR prostheses vary in geometry and design, producing a wide range of EOAs even within the same nominal valve size.

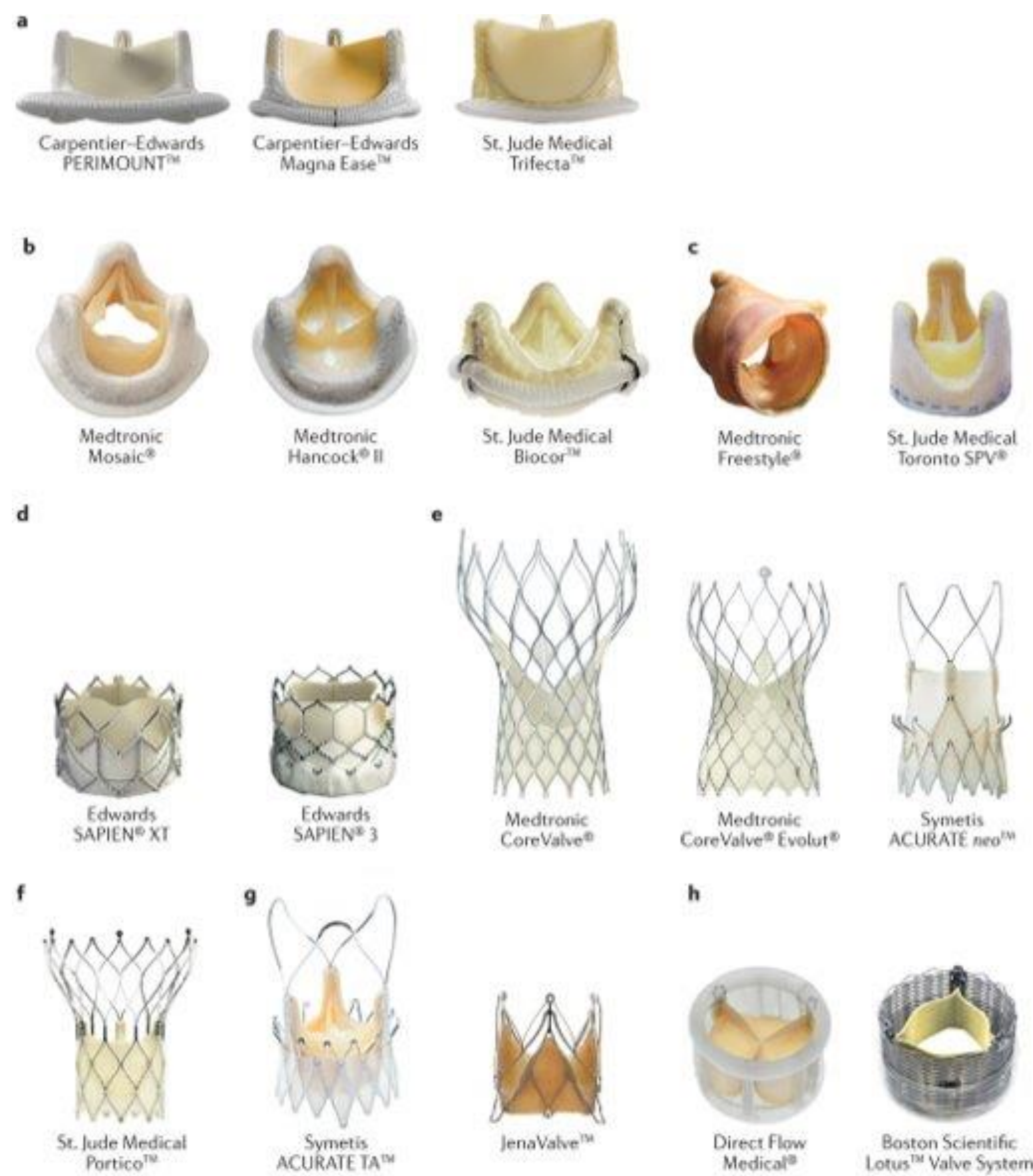
EOA is defined as the cross-sectional area of blood flow at the vena contracta—the narrowest point of the flow jet just downstream of the valve. It reflects the functional opening available for blood flow and is typically smaller than the anatomic orifice area due to flow contraction and valve frame interference. EOA is calculated for each patient using metrics assessed via echocardiography, but the valve manufacturers offer normal reference values to predict EOA.

Objective

To evaluate PPM as a predictor of long-term mortality after SAVR vs. TAVR in a veteran population.



Floersch, J., Evans, M.C. & Midha, P.A. 2021



Methods

We conducted a retrospective chart review of patients who underwent surgical (n=266) or transcatheter (n=372) aortic valve replacement at the San Francisco VA Health Care System between 2013 and 2022. Prosthesis-patient mismatch (PPM) was assessed using *predicted* effective orifice area (EOA) values, indexed to body surface area (iEOA = EOA/BSA), and stratified by body mass index (BMI) categories to account for guideline-recommended thresholds. The association between PPM severity and all-cause mortality was evaluated using chi-squared testing.

Table 1. Sample EOA Normal Reference Values for Common Valves (Hahn, R., & Pibarot, P. 2024)

Prosthetic	Prosthesis Diameter (mm)			
	19	20	21	23
Carpentier-Edwards Magna	1.3	-	1.5	1.8
Edwards Sapien	-	1.2	-	1.5

Table 2. Grading scheme for PPM, stratified by BMI. (Hahn, R., & Pibarot, P. 2024)

PPM	BMI (kg/m ²)	
	<30	≥30
Insignificant	>0.85	>0.70
Moderate	0.85 - 0.66	0.70 - 0.56
Severe	≤0.65	≤0.55

Key Findings

- Most SAVR and TAVR patients did not have significant prosthesis-patient mismatch
- Kaplan-Meier survival of SAVR patients was greater than that of TAVR patients at 1-, 5-, and 10- years
- PPM associated with mortality only in the SAVR group at mid- and long-term follow-up

Table 3. Distribution of PPM severity in SAVR and TAVR patients

PPM	SAVR (N = 266)	TAVR (N = 372)
Insignificant	65% (173)	83% (309)
Moderate	30% (80)	15% (56)
Severe	5% (13)	2% (7)

Table 4. Kaplan-Meier survival of SAVR and TAVR patients at 1-, 5-, and 10- years

Time	SAVR Survival (%)	TAVR Survival (%)
1 Year	95.5	89.7
5 Years	84.4	55.5
10 Years	58.6	27.8

Table 5. Chi-square analysis of association between PPM and mortality

Procedure	Survival	χ ²	df	p-value
SAVR	1-Year	1.3	2	0.53
TAVR	1-Year	0	0	1.00
SAVR	5-Year	14.7	2	<0.001
TAVR	5-Year	2.9	2	0.23
SAVR	10-Year	25.6	2	<0.001
TAVR	10-Year	0.6	2	0.73

Conclusions

Suggests TAVR valves may better avoid clinically meaningful PPM — informs surgical valve sizing strategies.

Further work includes collecting and analyzing measured EOA values to validate findings and assess real-world hemodynamics.